Sisters Mine Site

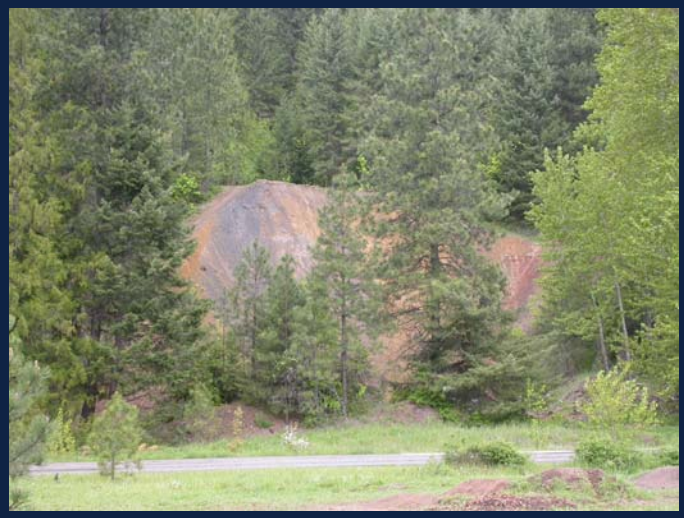
January 9, 2006

Remedial Design

2004-05: Summary of Findings

Background

- **Site Features**
  - **Collapsed adit, minor flows (~0.5 gpm)**
  - **Marginally stable slope**
  - **Elevated surface soil metals**
    - **Arsenic >100 mg/kg**
    - **Lead >1,000 mg/kg**
  - **No subsurface soil nor groundwater contamination**

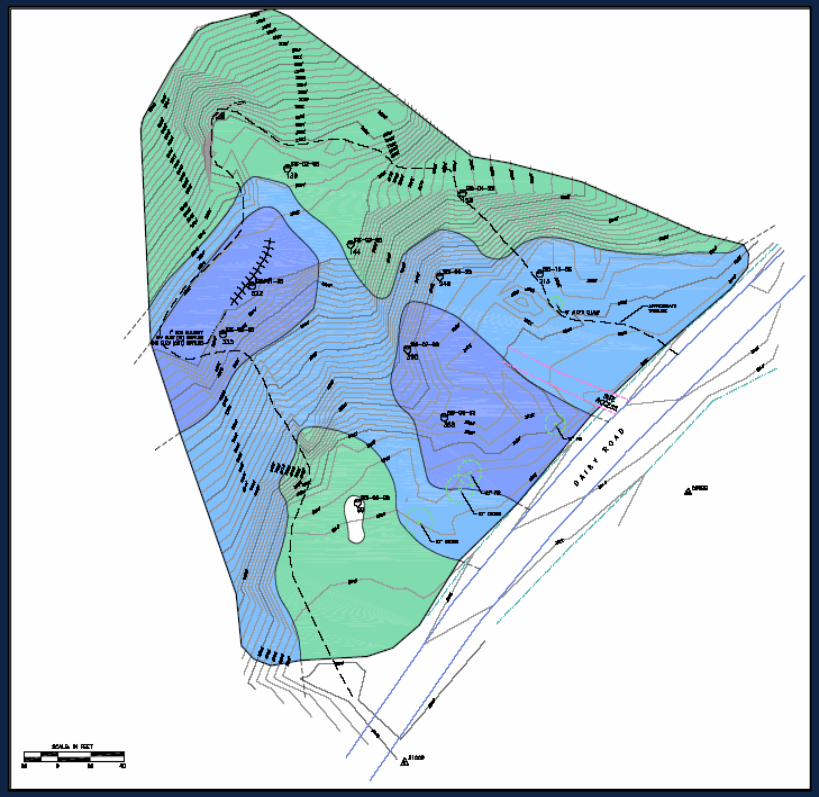


Background cont.

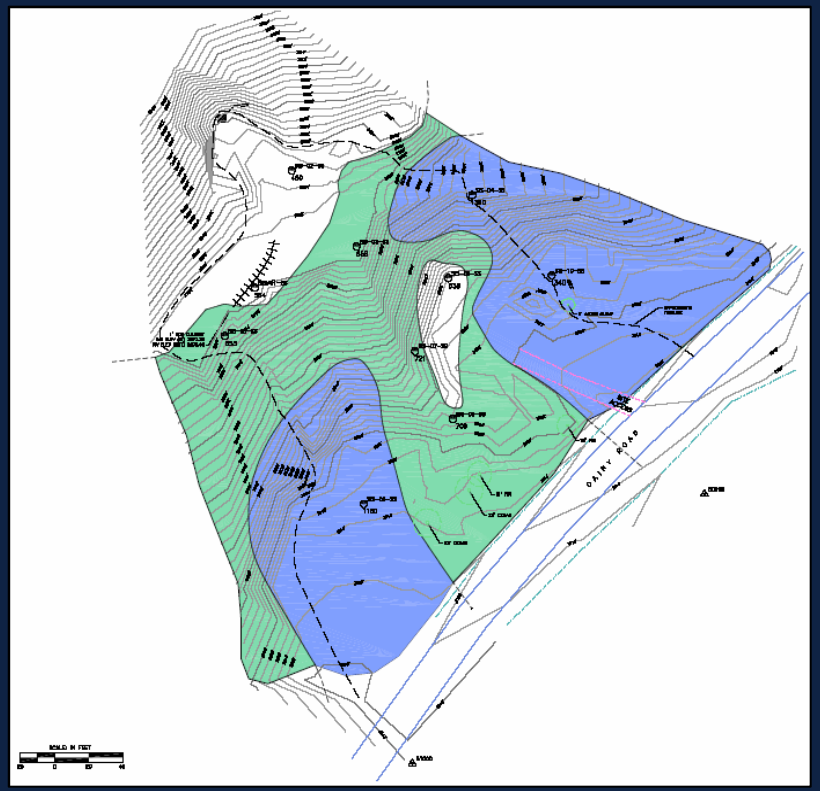
- **Autumn 2004 Sampling: Findings**
  - **Elevated surface soil arsenic (As) and lead (Pb) concentrations identified.**
  - **Dissolved zinc (Zn) concentrations with surface water samples (i.e., one adit) were ~13 times greater than the Idaho Ambient Water Quality Criteria (AWQC).**
  - **Delineation of lateral extents for surface soil contamination required.**

Background cont.

Interpolated [As] - 2004



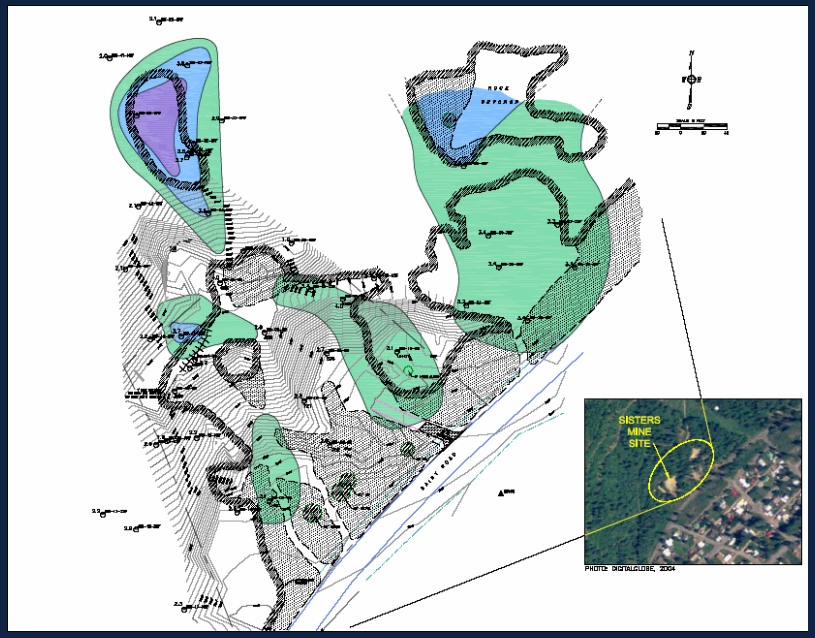
Interpolated [Pb] - 2004



Background cont.

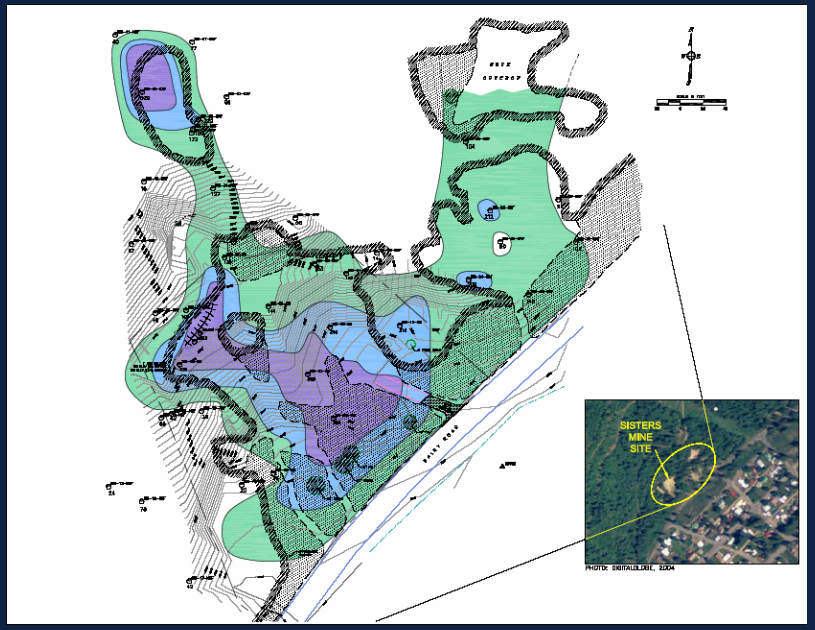
- **X-Ray Fluorescence (XRF) survey completed in Spring 2005.**
- **Confirmation that elevated soil contaminant concentrations largely limited to Sisters Mine site.**
- **Two previously unidentified areas identified as containing elevated metals.**
- **Two previously unidentified upgradient adits identified.**

Background cont.



[Pb] XRF Results - 2005

[As] XRF Results - 2005



Background cont.

Upgradient Adit

Residual Waste Rock

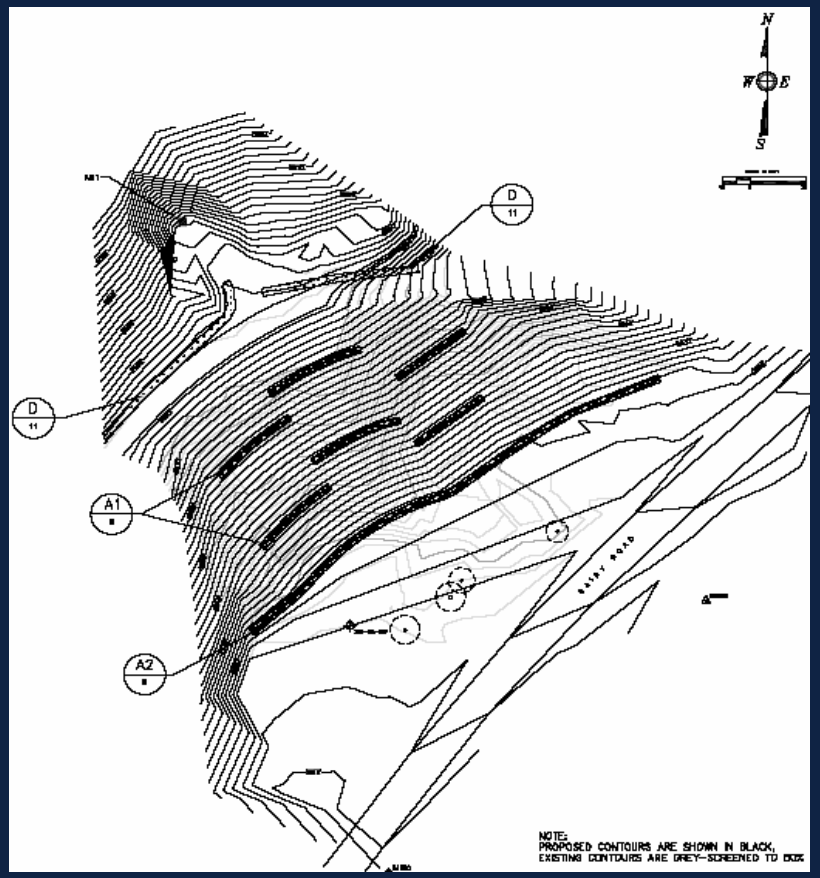
2005 Remedial Design

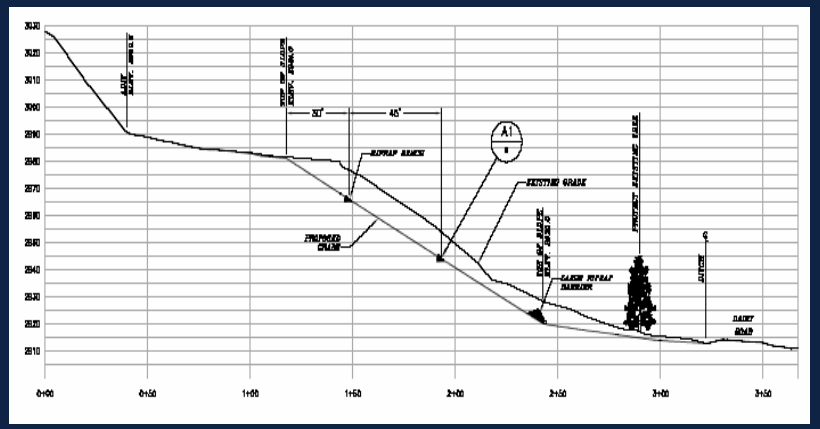
- **April 2005 - Developed and submitted 60% design package to address environmental and geotechnical concerns associated with the Sisters Mine site.**
- **May 2005 – Finalized remedial design for inclusion into Request for Proposal issued by Idaho Department of Environmental Quality (IDEQ).**
- **July to August 2005 – Remedial construction activities completed.**

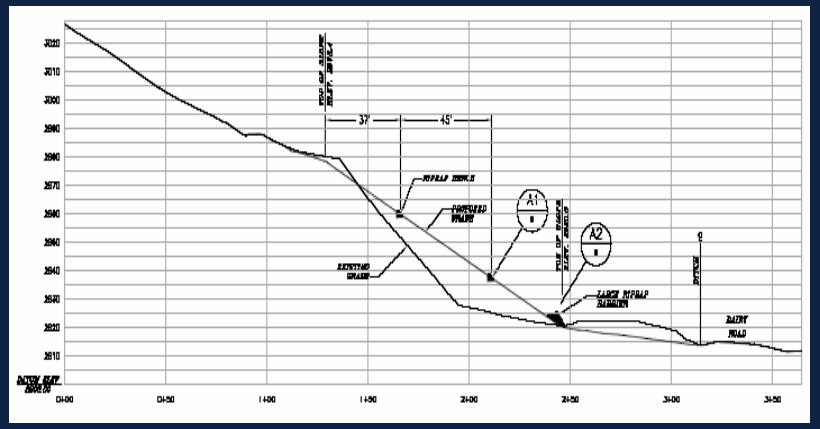
2005 Remedial Design cont.

- **Major Design Elements**
  - **Reduce/eliminate human health and ecological receptor exposures to elevated metal/metalloid concentrations,**
  - **Slope stabilization (i.e., flattening), and**
  - **Surface water run-on and run-off control.**

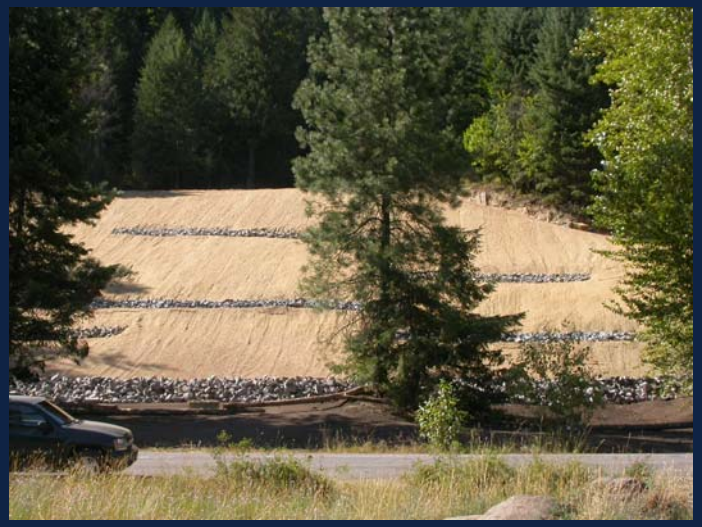
2005 Remedial Design cont.







2005 Remedial Design cont.



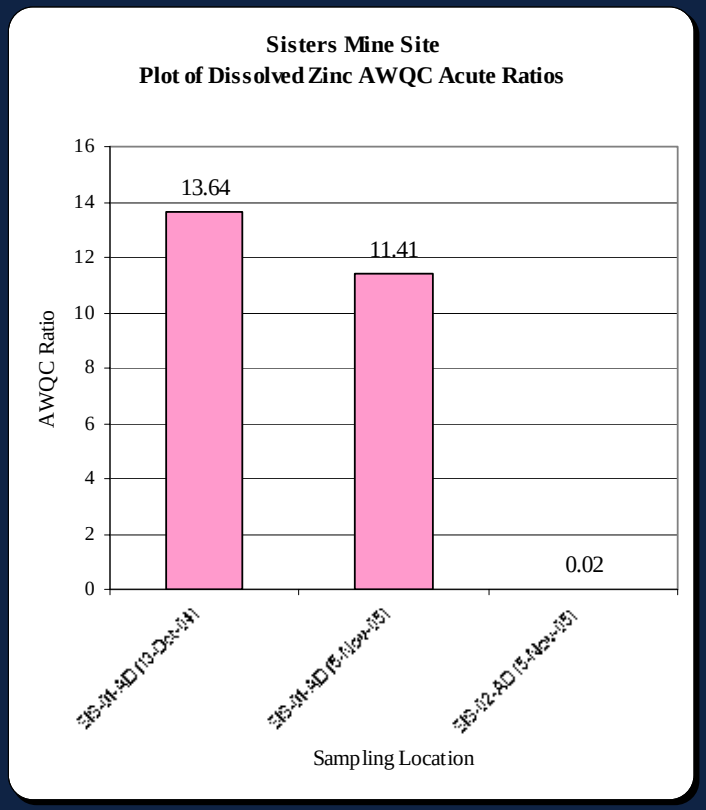
2005 Sampling Program

- **Key Elements**
  - **Qualitative and quantitative assessment of surface waters flowing from the adits,**
  - **Assess geochemical stability of residual waste rock, and**
  - **Confirmation of XRF data for residual waste rock (i.e., total metals); results pending.**

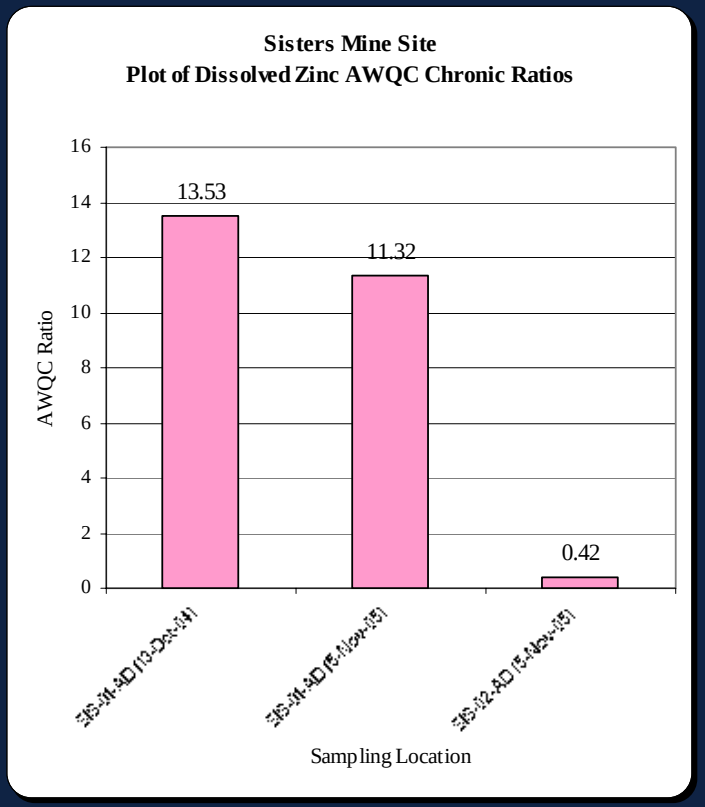
2005 Sampling Program cont.

- **Adits - Preliminary Findings (Dissolved [Zn])**

Acute AWQC Ratio

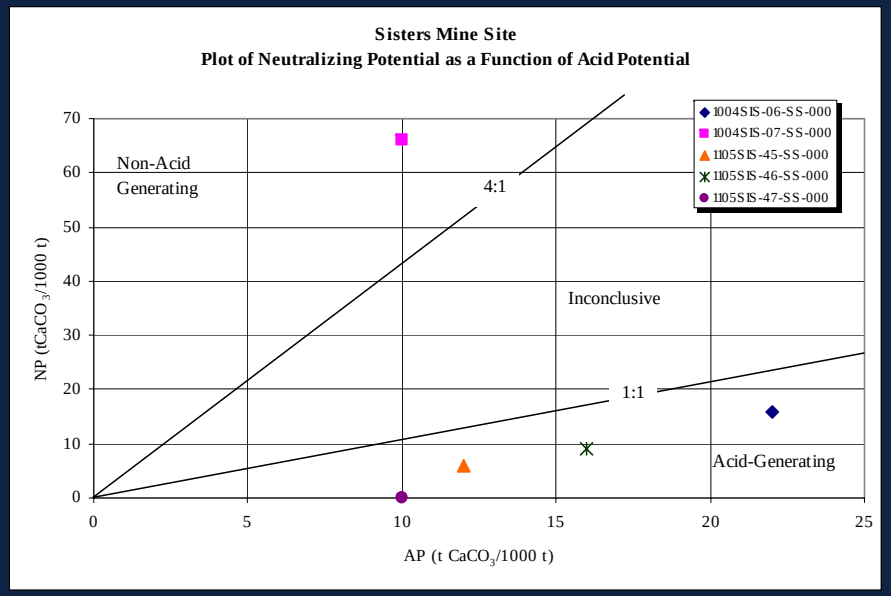


Chronic AWQC Ratio



2005 Sampling Program cont.

- **Acid Base Accounting**
  - **Plot of neutralizing potential (NP) as a function of acid potential (AP) would tend to indicate acid-generating material**
  - **Percent sulfide concentrations for all samples are «0.3%**
  - **Therefore conclude that material is non-acid forming.**



Potential Remedial Actions

- **Surface water – continued monitoring in conjunction with groundwater monitoring.**
- **Upgradient adits – Safety improvements on existing portal access (e.g., boarding).**
- **Residual waste rock – cover with six inches of topsoil and revegetate.**